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The Application of Sulphonamides in Veterinary Practice*

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In discussing drugs of the sulphonamide group it is essential that a clear understanding of the identity of the products under discussion be established. The use of trade names has resulted in endless confusion particularly in the case of sulphanilamide, which is sold under a variety of names. I have heard the respective merits of two products being heatedly discussed when actually they were chemically the same—namely sulphanilamide.

The planned and momentous discovery of prontosil rubrum—the original drug of the group—was the work of the German firm of Bayer. It was quickly overshadowed by the discovery of the less toxic sulphanilamide which is in such common use to-day and which is sold under a large variety of trade names.

Sulphanilamide is active in infections due to *B. haemolytic streptococcus*, pneumococci type iii, *B. coli*, meningococci, gonococci and *Cl. welchii*.

Sulphapyridine (M. & B. 693) is active against pneumonia of all types and against some types of staphylococci.

Sulphathiazole (M. & B. 760) has the same range as sulphapyridine but it is more active against staphylococci.

Sulphadiazine is the newest, the least toxic and the most active compound and has a similar range of activity.

Diaminodiphenyl sulphone seems to have the possibility of a wide veterinary future in streptococcal infections in large animals. It is reputed to be 3·5 times as active as sulphanilamide and 4·5 times as active as sulphapyridine. A peculiar feature is that it is markedly toxic for small animals and humans but has a relatively low toxicity for cattle. It has been utilised by McEwen, Pizer and Patterson (1941) in the treatment of mastitis with encouraging results.

SOLUBLE PREPARATION.—Sulphanilamide is only slightly soluble in water, 0·2 per cent.; 2 per cent. soluble in glycerol; 10 per cent. in E.O.S. which is acetaldehyde bisulphite, and 15 per cent. in L.S.F. which is bisulphite lactoxide.

The diamino soluble sulphone tetrasulphonate is 60 per cent. soluble and has been used in the treatment of wounds, sore teats, etc.

The sulphones offer a possible future advance in the treatment of tuberculosis, having shown some promise experimentally in the treatment of guinea-pigs.

Sulphaguamidine is soluble to the extent of 200 mgm. in 100 ml. of water. It is not absorbed from the alimentary canal unless the bowel is abraded, resembling magnesium sulphate in this respect. It is given in fairly large doses—0·05 gramme per kg. body weight—for diseases such as gastro-enteritis, calf scour, necrotic enteritis and coccidiosis. It has vast possibilities as a "steriliser" of the alimentary tract. It is, unfortunately, of no value in the treatment of rabbits with coccidiosis owing to its becoming acetylated and then absorbed from the bowel.

Soluseptasine (M. & B. 137) is a soluble sulphonamide widely used in veterinary surgery by parenteral administration and has the same indications as sulphanilamide. A soluble preparation of sulphapyridine known as M. & B. 693 soluble, is also available. This latter preparation is often associated with considerable pain on intramuscular injection and is therefore best given intravenously. Both preparations are rapidly absorbed and equally rapidly excreted and, in my opinion, are only indicated in hyperacute cases where there is difficulty in administration by the mouth or where gastric derangement exists. If intended to be used alone injections are required at frequent intervals. They can be given as the initial dose in very acute infections and treatment then continued by oral administration of the appropriate drug.

APPLICATION AND DOSAGE

Slow advances only can be expected in the sulphonamide group of drugs in the future. Their therapeutic value cannot be over emphasised when used in conditions in which their application is indicated.

As a general rule acute infections are more amenable to their influence than chronic ones.

We have a great deal to learn regarding the best method of obtaining a rapid and efficient concentration. Workers in the U.S.A. appear to have made the most progress in this problem to date.

It is estimated that a minimum concentration of 10 mgm., and in very acute infections, 15 mgm. per 100 c.c. of blood is required to give the best results. Anything less is not helpful and may be harmful. The Lovibond comparator can be utilised to give an estimation of the concentration achieved, the technique involved being comparatively simple and easy to carry out in practice.

Drugs of the sulphonamide group are often wasted by the administration of amounts less than the therapeutic dose and also by failure to maintain an adequate concentration through permitting too long an interval between dosing.

It should be emphasised that if the administration of these drugs is not followed by a definite early tendency to recover they should be stopped as they can be definitely harmful.

The initial doses must be large enough to achieve the required concentration and until that concentration has been achieved, efficient results cannot be obtained.

The inefficient application of these drugs—resulting from too small an initial dose followed by sub-therapeutic doses, or from doses given at too long an interval—may possibly produce a condition of "drug fastness" owing to antigens being produced, and resulting in the drug never reaching a concentration lethal to the causative organisms.

Efficient local application of sulphonamides to wounds demands the use of a microcrystalline product to avoid interference with granulation. There is also need to delay local absorption. Methods of achieving this are being investigated, one being an admixture with zinc oxide.

The action of sulphanilamide on haemolytic streptococci and other bacteria is simply to prevent the utilisation of a substance essential for their growth; this substance is *p*-aminobenzoic acid. The work of Fildes and Woods has established the chemical composition of this and of various other essential growth factors of certain pathogenic bacteria and the discovery of other essential growth inhibitors having similar relationship as sulphanilamide to *p*-aminobenzoic acid offers a wide field for future research.

Drugs of the sulphonamide group have been widely used in veterinary practice and the following remarks illustrate my own experiences. It is important to remember that where sulphonamides are used rational local treatment must not be neglected.

Horses.—In strangles sulphanilamide is a specific. The period of illness is reduced to a minimum and in a recent large outbreak in milk-round ponies I have had them returning to work within 14 days. Appropriate hygienic measures and the local treatment of abscesses, etc., are essential. I have also had good results in a few cases of pneumonia. I employ an initial dose of 3 oz. given by stomach tube in about a pint of water, followed by 1 oz. every eight hours given in electuary.

In fistulous withers I carry out the radical midline operation, excising the whole of the fistula, and then distribute 2 oz. of sulphanilamide over the surface of the wound prior to close suturing. I do not plug the wound but permit the copious blood clot which forms to control the haemorrhage. After two or three days I make a drainage opening at the side (or both sides in bi-lateral fistula cases) and remove the blood clot, at the same time removing one or two sutures at the midline position to allow sulphanilamide in powder form to be introduced, followed by re-suture of the midline incision. The wound is not irrigated, but is cleansed daily with hypochlorite solution. By digital pressure over the operation area towards the drainage opening it is kept free of discharge. Healing is greatly expedited and it is not at all unusual to have horses which have had extensive operations returning to work in a breast collar, in seven weeks.

Foals and Calves.—In joint-ill I have obtained better results with sulphapyridine, but sulphanilamide is also useful. In contagious pneumonia of calves sulphapyridine is of great value. In white scour I have had considerable success with sulphanilamide combined with appropriate dieting and the subcutaneous injection of normal saline in advanced cases. Dosage: sulphanilamide 3 grammes per 1 cwt. body weight followed by 1 dram per cwt. every eight hours. The dose of sulphapyridine is half this amount.

* Address in opening discussion of this subject at the meeting of the Mid-West Division, N.V.M.A., held at Bath, October 16th, 1942.

Pigs.—I have had excellent results in the treatment of cramp, in young pigs, with sulphanilamide. The value of sulphapyridine (as recommended by Shanks) in the treatment of swine influenza is also well recognised. Dosage: sulphanilamide gr. 40 per score body weight, followed by grs. 15 per score every eight hours. Sulphapyridine grs. 15 per score initial dose, followed by grs. 7½ every eight hours.

Dogs.—I find both sulphanilamide and sulphapyridine of great value in the treatment of distemper. As a local application in otorrhoea I have had most spectacular results in cases which previously I had considered incurable. I apply it either as a thin paste made up with glycerine or water or as a powder, wiping the ear free of discharge with dry gauze prior to application. As a local application to accidental and post-operative wounds, it is of great value and many wounds which in the past would not have been considered worth suturing now respond satisfactorily after cleansing, debridement and dusting with sulphanilamide. Dosage: 7½ grs. per 5 lb. body weight initial dose, followed by 7½ grs. for 15 lb. body weight every eight hours.

Cats.—In my experience sulphanilamide is a specific in both feline influenza and infectious enteritis. The dosage is one tablet of 7½ grs., followed by half tablet every eight hours.

In both cats and dogs I administer an alkali at the same time giving sodium citrate 2 grs. with each 7½ gr. tablet.

Cattle.—In cattle I use sulphanilamide—as a local wound dressing following amputation of the digit, to dust each line of sutures in rumenotomy, as a dressing for infected wounds of all kinds and as a post-operative dressing for all surgical wounds. In modern plastic surgery the value of drugs of the sulphonamide group has been markedly demonstrated since the war; they are used to dust the grafts and their use has been associated with more efficient results. The ditch method for ascertaining the possible value of the drugs on the particular type of organism concerned is freely utilised in some hospitals. The culture medium is impregnated with the drug across the centre of the plate and its likely value is assessed by the approach of the growth of the culture to the "ditch" so formed.

In acute metritis given *per os* and used as a local application into the uterus, sulphanilamide has proved of great value in conjunction with injections of stilboestrol dipropionate. I apply the sulphanilamide either as a powder or in the form of pessaries composed of 15 grammes of a mixture of sulphanilamide and sulphapyridine in the proportion of 3-1 in a soap basis (May & Baker). I have found these pessaries of considerable value following the late removal of retained afterbirth.

In the bull I have recently utilised pessaries of this type in trichomonas infection. I prefer pessary dressings to douches in the bull. They are rapid and easy to apply, less objected to by the bull, and more efficient. They can be carried high up into the prepuce where they remain and have a more prolonged action than a douche. Another preparation I use is ichthyol, gr. 90, in a glyco-gelatine base.

I have also found sulphanilamide of great value as a post-operative dressing following teat operations, in teat eruptions, and in cow-pox, applied either as powder or a watery paste, or, as an ointment or emulsion, in liquid paraffin or glycerine.

Following teat operations I give a course of sulphanilamide for four days as a prophylactic, results justifying the routine.

The principal use of sulphanilamide in bovines is in the treatment of mastitis due to streptococci. Where response does not follow three possible explanations are: (1) incorrect diagnosis, (2) faulty dosage which does not achieve and maintain the required concentration, (3) failure to give adequate rational local treatment. I believe it is agreed that we have a great deal to learn about mastitis. In acute and sub-acute mastitis due to *Str. agalactiae*, sulphanilamide will consistently give the results that have been claimed for it in my experience. In dysgalactiae infection it will effect improvement in acute and sub-acute cases if applied in the early stages, but return of the milk to marketable appearance is not usually effected unless a soluble sulphonamide or acriflavine irrigation (which may have to be repeated) is combined at the appropriate time. In *Streptococcus uberis* infection (group iii streptococci) I have not met the acute condition and have no experience of sulphanilamide therapy. I have, however, met the sub-acute or chronic type occurring late in lactation. I found acriflavine of no apparent value—but "milking through," *i.e.*, allowing no dry period at all, resulted in the vast majority of the cows calving down normally at the next lactation.

The occurrence of staphylococcal mastitis other than in the hyperacute form usually described, is, I believe, well established and accepted. During this summer in well over 200 mastitis cases more than 20 per cent. were positive to staphylococci on laboratory examination. There are certain clinical features which in my experience render clinical diagnosis of the different types of staphylococcal infection of the udder possible in the majority of cases. I am quite certain that careful observation combined with regular laboratory examination of milk samples from mastitis cases would prove very illuminating to all engaged in bovine practice and tend to greater progress in diagnosis and treatment. It is my experience that neither sulphanilamide nor sulphapyridine has any value in the treatment of staphylococcal mastitis and that a great many of the bad results attributed to sulphanilamide are due to the fact that staphylococcal mastitis is being dealt with. Similarly, I find neither of these drugs of value in the treatment of mastitis due to *C. pyogenes*—an infection which I believe, at least in the cow, is, in a large proportion of cases, superimposed upon previous streptococcal or staphylococcal infection. I believe efficient milking in the later stages of lactation and proper care at the drying off period, to be potent factors in the incidence of all types of mastitis.

Dosage.—An initial dose of 3 oz. given in a pint of water followed by 1 oz. every eight hours; I usually give the times, *viz.*, 6 a.m., 2 p.m. and 10 p.m. If there is a shorter interval between the first and second dose it is all to the good and tends to ensure an adequate concentration being achieved. Stripping and general management must not be neglected, and, to give appropriate attention, it is essential that the cow or cows should be segregated and kept in the byre. The result is usually rapidly manifest and I rarely continue sulphanilamide medication for more than four days. It is not advisable to stop administration directly the milk appears to be normal. Provided there are no symptoms of intolerance treatment should be continued for two days more, or, as an alternative, the quarter should be irrigated with a maximum of one pint of acriflavine 1 in 10,000 which can be left in the udder for 15 minutes—the cow subsequently being repeatedly milked for a further two days. These precautions are intended to prevent recrudescence of clinical symptoms and, in my experience, have given very satisfactory results. Where there is improvement but the milk does not return to normal in three days, I irrigate the quarter with acriflavine and repeat the irrigation in three days if necessary. I believe it is wrong to inject a quarter to what is considered to be normal distention and never utilise more than one pint in irrigating the quarter of a cow in full milk.

The local application of soluble sulphanilamides to udders has been tried in the last year or two. With the preparations at present in use the maximum concentration one can obtain in the udder is about 1 per cent. I have used soluseptasine 8 per cent.—a special isotonic solution made by May & Baker. I have also used sulphacetamide 10 per cent. (May & Baker) and sulphonamide E.O.S. (Imperial Chemicals) (as recommended by McEwen) in 5 to 10 per cent. solution. All these preparations can be left in the udder for a period of six to twelve hours. They can be repeated at short daily or two-daily intervals if considered necessary, and all give reasonably satisfactory results in sub-acute and chronic cases. The usual quantity injected is half to one pint. I have recently experimented with the sulphanilamide L.S.F. (which is a 15 per cent. solution of sulphanilamide, Burroughs Wellcome & Co.) given diluted in smal lbulk (150 c.c.) with equally satisfactory results. I have obtained a higher concentration in the udder (2 per cent.) by use of this product and have had particularly good results in cases due to *Streptococcus dysgalactiae* following administration of sulphanilamide *per os*. I have had cases of agalactiae and dysgalactiae infection which did not respond to acriflavine but did respond to one or other of these preparations. I am certain that they are a valuable asset in the treatment of streptococcal mastitis but high cost renders their general use prohibitive at the present time.

I am indebted to Dr. G. Brownlee, Dr. R. F. Montgomerie, Dr. A. W. Stableforth, Dr. A. D. McEwen and Miss Weddell, M.S.R.C.V.S., for their co-operation in various phases of the work and to Messrs. Burroughs Wellcome and May & Baker for placing materials at my disposal for clinical trial.

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Some Aspects of Diagnosis and Treatment of Sterility in Cattle*

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Clinically, the cows which a practitioner is asked to treat for sterility can be divided into a few main groups:—
(*a*) Cows which keep turning every three weeks.
(*b*) Cows which do not come in oestrus.
(*c*) Cows with irregular heat periods.
(*d*) Cows with vaginal discharge.

In a very short discussion it is better to deal with one or two main points, and certain findings in groups (*a*) and (*b*) will form the basis of this short paper.

Group A

Diagnosis.—In group (*a*) the history indicates that the ovarian cycle is normal and this is easily checked by rectal palpation of the ovaries. (Sections of ovaries in normal cycle shown.)

It is then a question of deciding whether the uterus and cervix are normal, or whether it is a case of metritis.

In my experience the best means of determining this is by a detailed examination of the cervix per rectum and, if necessary, vaginal examination.

The cervix is grasped in the hand per rectum and the outer diameter noted. With the thumb and forefinger the three annular folds of the cervix can be felt to see if there is any induration of these. The thumb can then be used to palpate the vaginal end of the cervix, and it is comparatively easy to decide if the external opening of the cervix is normal, or whether there is an oedematous protrusion of the inner folds of the cervix through the outer.

The whole of this examination takes only about 30 seconds, and if the diameter of the cervix is enlarged and there is protrusion of the inner fold of the cervix, there is no doubt about a correct diagnosis of metritis.

Cases of metritis are found when the cervix is quite normal, but these are rare and do not detract from the value of palpation of the cervix as an index of metritis.

Also in cows with cystic ovaries, a large cervix often results from the cysts, but those come in a group which we are not discussing at the moment.

Treatment.—With the extent of present knowledge, the treatment of cows in group (*a*) will then be divided into uterine irrigation for cases of metritis, and expression of the corpus luteum in those in which the uterus, etc., feel normal.

Uterine Irrigation.—This form of treatment is not at all satisfactory in cases of pyometra or where the uterus is still very enlarged as in cows whose uterus has not contracted up since calving, and irrigation should only be carried out when the uterus has contracted to a reasonable size.

Recent experience has shown that relatively large doses of stilboestrol dipropionate are very useful in treating this type of case, and after the injection of 50 mgs. to 100 mgs. the uterus has usually returned to a comparatively normal size in a week.

When uterine irrigation is carried out, it is unnecessary to use large volumes of solution and is also dangerous, as too great a distension of the uterus may lead to the fluid gravitating up the Fallopian tubes and causing adhesions of the ovarian bursa. Three ounces of solution for each horn of the uterus should be sufficient, and never more than four ounces should be used, making six to eight ounces for the whole uterus.

Expression of the corpus luteum.—This should only be carried out when the corpus luteum can be removed easily, that is during the mid-cycle period 7 to 14 days after the previous heat period. At earlier stages it is difficult to ensure that all the corpus luteum is removed, and at later stages than the 14th day it is unlikely that any good can result from the treatment, as the cycle will not be altered.

Group B

Diagnosis.—When examining cows or heifers in this group, palpation of the ovaries will decide what treatment is to be used to bring the animal in oestrus.

(1) Either the ovaries are small and inactive without any corpus luteum, indicating that there is no oestrus cycle, or

(2) A corpus luteum is present in one ovary, indicating that the cow is ovulating, and an oestrus cycle existing without the outward signs of oestrus, or

(3) The cow has cystic ovaries.

Treatment.—(1) Cows and heifers with small inactive ovaries should be treated with pregnant mare serum extract, the dose being about 2,000 I.U. and oestrus can be expected within seven days.

(2) Cows and heifers with a corpus luteum present should be treated by expressing the corpus luteum and oestrus expected in two to five days. If the corpus luteum is old (late cycle) and there is difficulty in expressing it, a second visit in a fortnight is advisable, when the corpus luteum of the next cycle will be at the right stage for removal.

(3) Cysts: when these are ruptured, in the majority of cases more cysts form when fresh follicles mature; so that a second visit a fortnight after rupturing is necessary, and cysts ruptured at this visit usually result in the formation of a corpus luteum. Oestrus can then be expected 21 days after rupturing the cysts a second time.

* Presented to the Eastern Counties Division, N.V.M.A., at Colchester, October 22nd, 1942.

Saturated Solution of Sulphamethazine as a Substitute for Drinking Water in the Treatment of Caecal Coccidiosis in Chickens—a Preliminary Note

by

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The satisfactory results obtained by us[1] in the treatment of caecal coccidiosis with sulphamethazine administered either in capsules or mixed with the food, led us to consider the possibility of successful treatment through the medium of the drinking water. In preliminary experiments the chickens drank a saturated solution of the drug quite freely and there were no ill effects during the period of observation.

A first test was made with eight one-week-old chickens, four of them having access to a saturated solution of sulphamethazine in place of drinking water for the duration of the experiment. Twenty-four hours after first receiving the solution all eight chickens, including the four controls on tap water, received massive doses of sporulated oöcysts. The control chickens died on the sixth and seventh days following infection and were found on *post-mortem* examination to be affected with acute caecal coccidiosis. No deaths occurred among the chickens receiving the solution of sulphamethazine, however, and when they were subsequently killed eight days after the death of the last control *post-mortem* findings were negative for coccidiosis.

A second experiment, carried out with ten one-week-old chickens consisted of infecting all birds with massive doses of oöcysts, and transferring half of them to the solution 48 hours later. Four controls died of acute caecal coccidiosis on the sixth day. The fifth control was killed on the eighth day when the caeca were found to contain hard cores, lesions were present on the mucous membrane, and numerous oöcysts and intracellular stages of the parasite were seen. The chickens which had received the test solution had remained healthy up to this time and when one was killed for comparative purposes on the eighth day, examination revealed neither lesions nor oöcysts. The remaining chickens which had received the solution survived and appeared to be in normal health.

In a third experiment four of eight chickens were given access to a saturated watery solution of sulphamethazine in place of drinking water 72 hours after infection. Some blood was observed in the faeces of both test and control groups on the fifth day, but whereas the controls died of acute caecal coccidiosis on the sixth day following infection, the test birds continued in good health and the blood soon disappeared from the faeces.

A fourth experiment was carried out in which five of ten chickens were first given the test solution 96 hours after infection with massive doses of sporulated oöcysts. Six days after infection copious haemorrhage was observed in both groups, but this had disappeared from the group on sulphamethazine solution on the seventh day. On this same day four of the five controls succumbed to acute caecal coccidiosis. On the eleventh day after infection one of the chickens from the group receiving the solution died and *post-mortem* examination revealed hard caecal cores. A week after the last death in the control group the sole surviving member of that group and the remaining chickens on sulphamethazine solution were killed and examined. Numerous oöcysts were isolated from the caeca of the control chicken which was in poor condition, whereas the treated chickens were in good condition, although hard caecal cores were observed in one of them.

To test the efficacy of the drug still further, and to assess

its value when applied during the course of an epidemic of coccidiosis, a larger experiment was undertaken in which 161 birds in one group received suspensions of oöcysts in the food, one of three hoppers being infected daily in this way. On the sixth day five chickens died of acute caecal coccidiosis and blood was observed on the floor of the pen. The surviving chickens were then equally divided into two groups of 78 birds and placed in separate pens. Water was then given to one group and sulphamethazine solution to the other and equal doses of sporulated oöcysts were administered daily in the food to both groups for the duration of the experiment. The results are shown in the accompanying table.

Effect of Sulphamethazine taken in the drinking water during the course of an epidemic

Days from beginning of epidemic	Number of chickens dying of acute caecal coccidiosis	
	Chickens receiving water	Chickens receiving Sulphamethazine solution
0	—	1
1	4	4
2	4	2
3	8	1
4	5	—
5	10	—
6	3	—
7	3	—
8	2	—
9	2	—
10	—	—
11	—	—
12	1	—
13	—	—
14	1	—
Total deaths :	43	8

It will be seen from the table that 55 per cent. of the control birds succumbed to acute caecal coccidiosis as against 10 per cent. of the treated birds.

At the time of writing ten days have elapsed since the last control bird died and the surviving birds of both groups are active and in good condition, and further deaths from coccidiosis appear unlikely.

These results compare favourably with results previously reported[1] for sulphamethazine given in the food.

Reference

[1] Horton-Smith, C., & Taylor, E. L. (1942). *Vet. Rec.*, **54**, 516.

VALUE OF THE VETERINARIAN TO PUBLIC BODIES

A decade ago we took occasion to comment encouragingly on the increasing tendency then manifest among members of the profession to seek election as members of their local authorities, as evidence of a growing appreciation of the fact that at a time when the importance of veterinary public health was becoming widely recognised, the presence of veterinarians on such bodies was of great value. To our knowledge many of our confrères are now rendering service is this sphere, and in this connection the following note from *The Bolton Evening News* merits reproduction in these columns:—

"In a maiden speech in the Town Council, Councillor Adamson showed the value of having on public bodies men with specialised knowledge. One of the most disturbing statements made in the debate on milk infection was to the effect that cows suspected of being tuberculous can disappear whilst the tests which are to establish their guilt or otherwise are in progress, the impression given being that they may go to another farmer and that their milk may continue to contaminate that of another herd. As a veterinary surgeon, Councillor Adamson knows exactly what happens in such cases, and he was able at once to deny the possibility of any such happening. He assured the Council that once a cow is suspect it cannot escape official supervision, and if it is found to be infected it is dealt with in such a way as to preclude any further danger."

CLINICAL COMMUNICATIONS

An Ectopic Kidney

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An interesting displacement of the left kidney of the sheep was examined in this department. The left thoracic section of a frozen sheep's carcase showed a swelling on the lateral aspect of the rib: just beyond the upper margin of the axillary border of the scapula. The swelling on opening showed a fully developed kidney in what appeared to be normal condition. The kidney was surrounded by perirenal fat of the same consistency and abundance as that surrounding a normally placed organ. The shape and microscopic structure were more or less normal. Unfortunately, the ureter and vessels could only be traced for a short distance toward the sternum; these had been cut in the preparation of the carcase. Microscopically, the various parts of the uriniferous tubules demonstrated a little autolysis, probably due to the long period of transportation between New Zealand and this country. Most of the epithelia of the tubes were clearly seen.

It is extraordinary to find a kidney in this position and to have been maintained here in a normal and healthy condition and apparently carrying out its normal function. Several hypotheses may be suggested as to how it got there—by rupture of the abdominal wall in the early embryo or by ectopic development of the mesonephros followed by the metanephros. Nothing definite can be decided as so much is missing that might have given some clue to its origin.

The experimentalist, by interference with the nephrotomes, may cause extraordinary anomalies of the kidney both in respect to its form and position. The kidney of the domesticated animals is so rarely found outside the body cavities that this unusual occurrence seemed worthy of record.

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The Use of Antimosan Against Trypanosoma evansi Infection in the One-Humped Camel

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Recently, owing to a temporary shortage of antrypol and naganol, it became necessary to find a drug which could be given as a single injection for the cure of *Trypanosoma evansi* in the one-humped camel. Antimosan was the only drug available for trial and the following results were obtained. The experiments were carried out in a locality in which trypanosomiasis is known not to occur.

Camel No. 1.—A large five-year-old male; said to have a chronic infection. Bennett's test positive on 1.1.42. Condition poor. At 11.15 a.m. on this day the blood was swarming with trypanosomes, and at this time 80 ml. of antimosan were given subcutaneously. At 4.15 p.m. no trypanosomes could be seen in the blood. 31.1.42. Bennett's test positive and again on 23.2.42, when the camel was discharged.

Camel No. 2.—A large eight-year-old male. Infection said to be of recent origin. Bennett's test positive on 6.1.42. Condition poor. No trypanosomes were seen in the blood; the temperature was normal; 40 ml. of antimosan given subcutaneously on that day. Bennett's test negative on 31.1.42 and again on 23.2.42, when camel was discharged.

Camel No. 3.—A thirteen-year-old medium-sized female. Infection said to be of recent origin. Bennett's test positive on 6.1.42. Condition fair. The blood was swarming with trypanosomes, and the temperature was normal; 40 ml. of antimosan given subcutaneously on that day. Bennett's test positive on 31.1.42, and again on 23.2.42, when the camel was discharged.

Camel No. 4.—A nine-year-old female camel having a chronic infection. Bennett's test positive on 11.1.42. Condition very poor. The camel was running an early morning temperature of 104·2 and trypanosomes were seen in the blood; 60 ml. antimosan given subcutaneously on that day. Temperature 106·2 on 13.1.42 and blood negative for trypanosomes. Bennett's test positive on 31.1.42, and again on 23.2.42, when the camel was discharged.

Camel No. 5.—A six-year-old medium-sized male camel. Said to have been infected for four months. Bennett's test positive on 17.1.42. Condition fair. The blood contained a heavy infection with trypanosomes and the early morning temperature was 106·4; 60 ml. of antimosan were given subcutaneously on that day. Bennett's test positive on 31.1.42, and again on 23.2.42, when the camel was discharged.

ANNOTATION

Certain Aspects of Trichomonas Infections

In the recent statement on Bovine Trichomoniasis in Great Britain, prepared by the Ministry of Agriculture and Fisheries and published in this journal on October 17th, 1942, only the distribution, diagnosis and treatment of this condition were dealt with at any great length. This annotation is concerned with other aspects of the condition, including economic loss and possible pathogenicity.

The incidence of trichomoniasis of the bovine genital tract and the resultant economic loss have been more extensively studied during recent years. Rees[1 2] investigated the disease in a herd of dairy cattle, including 20 bulls, for about 18 months during which an average of 125 females of breeding age were examined seven times. The average annual calf crop from the infected heifers and cows was 0·1 calf per cow, and from the non-infected animals the average was 0·7 calf per cow. Of the 20 bulls, six, or 30 per cent., were infected, and each infected bull sired some living calves. In a herd of 40 heifers observed by Andrews and Miller[3], trichomonads were found in the vagina for periods of time varying from 7 to 20 weeks by the particular method of detection employed. They confirmed the fact that the disease tends to be self-limiting since it appears to decline spontaneously in clinical severity and in zoological density. They also produced ample evidence that, associated with the presence of the organisms and varying directly in their incidence with the persistence of infection, such conditions as pyometritis, abortion, stillbirth, delay in conception and persistent sterility are directly associated with trichomoniasis. From the 40 heifers examined, four calves were aborted, two were stillborn and one was lost "apparently by pyometra." Seven heifers were slaughtered about 62 weeks after the first service, because they showed no signs of pregnancy; one of these, however, was found to be pregnant. Normal pregnancies occurred in 26 cases, but the accumulated excess of time beyond the theoretical normal time required to produce these calves amounted to 480 weeks. Schoop[4] investigated the disease in the neighbourhood of Kurhessen which he divided into 14 districts, each of which included 46 areas and each area was further subdivided into regions. In each region the average number of breeding animals in a herd was 200, of which about 80 aborted or were sterile. The loss of milk per infected animal was estimated to be 1,000 litres. Thus, in a region in which 80 animals are infected, the resultant loss would be 80,000 litres of milk, and in the 46 areas the loss would therefore amount to 3,680,000 litres. There would also be an additional loss of 80 times 46 or 3,680 calves. Madsen and Jensen[5] found that, during a period of eight years, 506·5 months of production were lost from temporarily and permanently sterile heifers. During the same period the cows lost 293·5 months of production, the economic loss of which was overcome by extended lactation periods. Again there was evidence to suggest that the disease is, to a certain extent, self-limiting because although 18 and two cases of infection were found in females and bulls respectively over a period of three years, ten of the females made complete recoveries.

On the other hand, McNutt, Blohm and Barger[6] examined 637 cows and heifers slaughtered in Iowa and found trichomonads in only four heifers, of which all came from the same farm. From this examination and the observation of herds over a period of six years, they concluded that the incidence of trichomoniasis was low, at least in Iowa, as probably less than 0·5 per cent. of the herds was infected.

Out of 560 bovine uteri examined by Morgan[7] at a packing plant in Wisconsin, 416 were pregnant and normal, 110 were non-pregnant and normal, 31 were non-pregnant with pyometra, and three were pregnant with pyometra. Of the total uteri examined, eight, or 1·4 per cent., were positive for trichomonads, and of these, five were in the third group of non-pregnant uteri with pyometra and two were in the last group. The remaining case was in an apparently healthy seven-months-old foetus, the amniotic fluid of which was teeming with trichomonads. A further 1,577 uteri were examined by Morgan and Wisnicky[8], of which 997 were pregnant and 580 were non-pregnant. *T. foetus* was found in two of the pregnant group and in 13 cases of pyometra in the non-pregnant group; that is, 0·95 per cent. of all the slaughtered cows was infected. No trichomonads were found in 211 bulls examined at the same abattoir.

As regards the disease in bulls, Andrews and Miller[9] examined some of the sires in the herd already mentioned (Andrews and Miller[3]), as well as other stock. Their results, in general, confirmed those of previous investigators concerning the predilection site of the parasites, because organisms were found solely on the glans penis and prepuce. One of the bulls was shown to have remained positive for trichomonads, without any opportunity for reinfection, for at least eleven months. Rees[1] also found *T. foetus* on the penis only and in no other part of the genital tract of a bull which had been infected for several years. Swangard[10] failed to find any trichomonads in the ureters, vas deferens or testes of infected bulls. Abelein[11] made extensive investigations of the distribution of trichomonads in infected bulls and did not support the view that the organisms eventually disappear from the preputial sac. He found *T. foetus* in the preputial sac of 150 out of 153 infected bulls but could get no evidence that this parasite invaded the blood, semen, or urinary system and he suggested that there was no proof that trichomonads, isolated from such situations, were, in fact, *T. foetus*. Kerr[12] does not agree with this statement for he was able to demonstrate the presence of *T. foetus* in the urethral tract, epididymis, and preputial sheath. He suggests that the blood stream parasite described by Küst[13], Wagner and Hees[14] and other authors was not a trichomonad but was an entirely different parasite (probably *Trypanosoma theileri*) and not in any way associated with trichomoniasis of the genital tract.

Attempts to determine whether or not *T. foetus* is pathogenic have also been made by experimental inoculation. Rees[15] inoculated intravaginally four virgin heifers with a bacteria-free strain of *T. foetus*. Two control heifers conceived at the first service and each delivered a healthy calf. One of the four experimentally infected animals was killed because she appeared to be anoestrus but the other three heifers retained trichomonads for 60 to 90 days after inoculation. They came into oestrum irregularly and at each period were served by non-infected bulls. Eight months after inoculation only one heifer was pregnant, and three months later the other two showed signs of pregnancy. After another five months, or 15 months after the initial infection, none had calved. Three other heifers, served by an infected bull, became infected after an average incubation period of twelve days.

Rees[16] later reported that, in ten females infected either through coitus or by intravaginal inoculation of pure cultures of *T. foetus*, the fecundity of the host was tested with the following results: one heifer failed to come into oestrum; one pregnant heifer exposed to infection during gestation showed no ill effects; two cows, not previously exposed, and five heifers developed breeding troubles, particularly failure of early conception and disturbances of the oestrus cycle; one heifer developed pyometra and trichomonads were present in the vaginal discharge for 18 months. With the exception of this last animal, the other nine conceived after recovering from the infection and seven were either pregnant or had calved at the time Rees' paper was submitted for publication. Rees also records that four cows, which had been exposed to infection as heifers, were served by an infected bull and all became positive for *T. foetus*, but conceived without any appreciable delay. A bull, infected from a heifer, retained trichomonads for 20 months and all of ten females served by this bull became infected, regardless of whether or not they had been previously infected. Beller and Schaaf[17] infected 17 cows and a bull by intravaginal and intrapreputial inoculation of pure cultures of genital trichomonads; intravenous inoculations failed to transmit infection. Trichomonads were found by microscopical or by cultural methods for varying periods up to ten months in vaginal or uterine mucus, but they were rarely or infrequently found after a year in the infected bull. Infection resulted in abortion in two cases, pyometra in two cases and sterility, often with anoestrus, in eight cases. In three cows, in which trichomonads were demonstrated, pregnancy was normal. Beller and Schaaf considered that the manifestation of symptoms was not dependent upon simultaneous bacterial or virus infection, but that the variation in clinical response was associated with constitutional or environmental conditions. Garlick[18] infected two three-years-old cows by artificial insemination. The first cow, which had previously borne one normal calf, was injected with semen from a known infected bull. As she did not conceive at the first attempt, two more injections were made. She did not become pregnant, and six and a half months after the first attempt at insemination she was slaughtered, when it was found that the uterus and ovaries were apparently normal. *T. foetus* was, however, cultivated from the vagina but not from the uterus. The second cow, which had already delivered two normal calves, received semen from the same bull and *T. foetus* was recovered 15 days after insemination.

In view of the increasing practice of artificial insemination the transmission of trichomoniasis in this manner becomes a very real

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Camel No. 6.—A large sixteen-year-old male camel. Said to have been infected for six months. Bennett's test positive on 21.1.42. Condition fair; 50 ml. antimosan given subcutaneously on that day. Bennett's test positive on 31.1.42 and again on 23.2.42, when the camel was discharged.

On the conclusion of the trial all the camels were positive to Bennett's mercuric chloride test except No. 2, which was negative. On the whole the camels improved in condition while under observation, but not so much as one would have expected considering the available grazing; they had in general a good appetite and chewed the cud.

It may be concluded that these single injections of antimosan did not cure the infection.

possibility. Although Abelein[11] could not find any evidence that trichomonads may occur in the semen or vas deferens, it is reasonable to suppose that they could very easily contaminate the semen during its collection.

Rees and Garlick[19] experimentally infected 15 cows and heifers by intravaginal inoculation of pure cultures of *T. foetus* and by allowing service with an infected bull. There had been no previous infection in ten of these animals, but the remaining five had already suffered from the disease. In most cases the first infection was severe, whilst reinfection was mild. One heifer infected during pregnancy showed no ill effects; another showed no evidence of oestrus; in seven cases infection resulted in failure of early conception and in irregular or temporary absence of oestrus but infection was finally overcome and a normal pregnancy followed; in one heifer conception was followed by pyometra; one cow which had a vaginal infection as a heifer showed slight resistance to reinfection, whilst four cows reinfected and then served by an infected bull showed marked resistance. When the animals were infected intravaginally the incubation period appeared to be only two days, but by coitus the average period was 11 days. The method of transmission did not appear to have any effect on the course of the disease. Trichomoniasis developed in every female served by an infected bull and *T. foetus* was found in 58 per cent. of all vaginal examinations. Infection in a bull for 20 months had no apparent effect on potency. These authors considered that the most serious aspect of trichomoniasis is infection in the bull because (1) the infection appears to be permanent, (2) transmission can occur at every service, and (3) even semen from an infected bull used for artificial insemination may transmit the infection. Beller, Schaaf and Scherle[20] infected a 16-months-old bull by a series of intrapreputial injections of a pure culture of trichomonads and by service of an infected cow. The bull later transmitted infection but demonstration of organisms in the bull was very difficult and uncertain. It was suggested that the only reliable diagnostic method for bulls is to allow them to serve uninfected cows, which can then be examined after they have had time to become infected.

Abelein[21] caused eight heifers to be served by bulls which had not previously been used for service. The former were then injected intravaginally with a pure culture of *T. foetus* with the following results: two heifers aborted at four to six weeks and two others within three months; two developed endometritis; one became sterile; and only one calved normally. To show that trichomonads can establish infection in the preputial sac of bulls without the agency of such secondary factors as a virus or preputial catarrh, Abelein infected nine young bulls, which had not served any cows, by intrapreputial inoculation. Six bulls remained healthy and in the other three trichomonads remained for six weeks, four months and over six months respectively. He suggested that trichomonads may be able to lead a saprophytic existence or maintain a parasitic existence in other animals and thus account for reinfection of clean herds. He also considered the possibility of the organisms becoming encysted and being able to survive outside the body for long periods of time. Schoop and Oehklers[22] observed rounded forms in their cultures of bovine trichomonads which they suggested were possibly encysted forms. On the other hand, Pereira and de Almeida[23] did not believe that cyst formation occurred. In any case, the amoeboid forms they described from cultures of *T. vitali, T. muris, T. caviae* and *T. hominis* were not thought to be related to the so-called cysts, and they were not degenerating forms.

The possible relationship between trichomonads of mammals and of birds was studied by Hees[24], who reported upon an increased incidence of vaginal trichomoniasis in women in Wiesbaden. The trichomonad isolated from the blood and vaginas of human cases was not *T. vaginalis*, but a five-flagellate form, morphologically intermediate between *T. hominis* and *T. ardin delteili*. When the epidemic was subsiding only *T. vaginalis* could be cultivated from the genital tract. Hees carried out a series of transmission experiments on human volunteers, using various pure strains and trichomonads isolated from the blood and uteri of infected cattle. Inoculation of *T. columbae* into healthy vaginas produced no infection and these cases were used as controls. Inoculation of *T. foetus* into the vaginas naturally infected with *T. vaginalis* reinvigorated the latter, but *T. foetus* was demonstrable for only a few hours and could not be cultivated. Inoculation of *T. foetus* and *T. vaginalis* into healthy vaginas resulted in the discharge of unaltered trichomonads for 12 days and 15 days respectively but neither organism multiplied nor could they be cultivated. Cervical inoculation of *T. hominis, T. ardin delteili* and a bovine strain resulted in severe symptoms of *T. vaginalis* infection after eight days. Subcutaneous inoculation of *T. foetus* produced similar results in six out of ten cases. No infection of blood or faeces was detected. Attempts to set up infection by oral administration of a single dose of *T. foetus* failed in two cases. In a third case, five large doses were given in six days; after the eighth day the *T. hominis-arden delteili* group was cultivated from blood and faeces. Two weeks later, large numbers of *T. vaginalis* were found in the vaginal and cervical discharges. Hees concluded that all human and mammalian species are variants of a single *Trichomonas* and that reversible dissociation is responsible for the variety of forms encountered. (As already mentioned, Abelein[21] did not support this view, for he considered that the three flagellate *T. foetus* is a distinct species from the blood form of Küst[13] and from other four-flagellate forms of man and animals.) Hees believes that cattle may be a source of human epidemics; the Wiesbaden outbreak coincided with a change in the local milk distribution, involving the pooling of supplies from various herds. He also considers that infection may be carried by dogs, cats and house flies. Transmission through the agency of house flies has been suggested by various authors and has recently been studied by Morgan[25]. Specimens of *Musca domestica* were fed living *T. foetus*, which were recovered from the digestive tract 0·5 to 17 hours after feeding. Re-isolation of trichomonads from two flies showed that the flagellates may be still capable of setting up an infection. Living trichomonads were recovered from the faeces of the flies for as long as eight hours after ingestion. Morgan considered that, under favourable environmental conditions, infectious material regurgitated one to five minutes after ingestion may set up an infection, and that it may be possible for the fly to disseminate the disease by defaecating on the genitalia of cattle.

The possibility of the existence of reservoirs of infection was suggested by Schoop and Stolz[26] who isolated trichomonads from the uteri of four out of five roe-deer suffering from sterility. They observed that the organisms were morphologically similar to *T. foetus*, although they were slightly smaller. Later Schoop[4] suggested that if the trichomonads from cattle and deer should prove to be identical, such wild animals might possibly form the source of some outbreaks in bovines.

In an attempt to provide more evidence for the theory that the lower animals may serve as a source of infection for human vaginal trichomoniasis Trussell and McNutt[27] made intravaginal inoculations of bacteria-free cultures of *T. foetus* and *T. vaginalis* into cattle, swine, sheep, goats, horses, monkeys, guinea-pigs, rabbits, cats and dogs. Of these, only monkeys became infected with *T. vaginalis*. Cattle were infected with *T. foetus* and transient infections were obtained with this parasite in dogs. Oral, rectal, subcutaneous, intraperitoneal, intravenous and intracranial inoculations with both organisms into some of the above mentioned animal species and, in addition, chickens, turkeys and pigeons were unsuccessful. No human inoculations were made with the bovine trichomonad. These authors thus concluded that the possibility of human infection arising from animal reservoirs is remote.

M. L. Bingham.

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Weekly Wisdom

The central fact in the social crisis of our time is that the industrial plant has become the basic social unit, but that it is not yet a social institution.—"The Future of Industrial Man."—P. F. Drucker.

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The Chief Veterinary Officer for Birmingham reports that on one day in October of 107 cattle in the Birmingham market for slaughter 101 had to be detained for detailed inspection. Out of 101 carcases 78 were found to be affected with tuberculosis, and 23 with other diseases. As a result, 13 whole carcases were condemned for tuberculosis.—*Meat Trades Journal.*

National Milk Testing and Advisory Scheme

Health Ministry's Letter to Local Authorities

We reproduce below the text of a letter (Circular 2761) on the above subject addressed to local authorities (England) by the Ministry of Health and dated February 9th, 1943. The letter is signed by the Assistant Secretary to the Ministry, Mr. Butcher.

I am directed by the Minister of Health to refer to Circular 2669 of July, 1942, in which the attention of Authorities was called to the above-mentioned Scheme and to say that he has been in consultation with the Minister of Agriculture and Fisheries, and desires to make the following suggestions with regard to the co-operation of Authorities in the working of the Scheme.

The primary objects of the Scheme are to prevent, as far as possible, the serious loss of milk from souring which occurred during the first two years of the war, and to improve the keeping quality of the milk. It is desired to emphasize that the Scheme is essentially an extension of the commercial relation between buyer and seller and that, as stated in the previous Circular, it does not alter any requirements of the Food and Drugs Act, 1938, and Orders and Regulations thereunder, relating to milk.

Apart from the special problems presented by the milk of producer-retailers and milk delivered direct from farms to the smaller dairy units, there are two main features in the Scheme—

(1) A standard Routine Test to be applied at frequent intervals to all farm milk supplies, at the place of first delivery, in order to assess their keeping quality and provide a basis for advisory work; and, in addition, particularly during the summer months, a quick standard Platform Test, applied daily on arrival to milk suspected of being of poor keeping quality. Unsatisfactory results are brought to the notice of the War Agricultural Executive Committee of the County in which the producer's farm is situated.

(2) It is then the function of the War Agricultural Executive Committee to cause a visit to be paid to the farm in order to ascertain why the milk is defective and to suggest a remedy. In this, the Committees are extending work which has long been the function of the advisory services of County Councils.

These arrangements are being brought into operation as rapidly as possible. The responsibility for administering the Scheme rests with the Ministry of Agriculture and Fisheries. The testing referred to at (1) above is being done as far as practicable in trade laboratories, licensed for the purpose on behalf of the Ministry of Agriculture and Fisheries, the laboratory facilities and testers being subject to the approval of the provincial dairy bacteriologist.

Representation of Authorities on Sub-Committees of the War Agricultural Executive Committees.—In order to secure the fullest co-operation, it is desirable that in each County the views of the Authorities concerned should be available to the appropriate Sub-Committee of the War Agricultural Executive Committee for that County. The matter appears to the Minister to be one for local arrangement, but it is suggested that the object in view can best be secured if in each County (*a*) the County Council, and (*b*) the Authorities responsible for the Milk and Dairies Orders are willing to authorise a suitable professional officer or officers (e.g. Medical Officer of Health or Sanitary Inspector) to serve on the County Sub-Committee of the War Agricultural Executive Committee. Since, however, these Sub-Committees have, the Minister understands, a very small membership, it will be desirable to arrange for not more than one or two persons so to act in each County on behalf of the Authorities responsible for the Milk and Dairies Orders in that County, and it is understood that arrangements of this kind have already been made in some Counties by the appointment of one or two Sanitary Inspectors. The Minister has instructed his Principal Regional Medical Officers to give any assistance they can in order to facilitate such arrangements, and he is informed that the Minister of Agriculture and Fisheries is approaching War Agricultural Executive Committees upon the matter.

Advisory work and the Milk and Dairies Orders, etc.—The Scheme will bring to the notice of War Agricultural Executive Committees the sources of unsatisfactory farm supplies. Local Authorities will also be aware of cases of the kind through their work under the Milk and Dairies Orders. By keeping in touch with each other, it is considered that in cases of difficulty Authorities will often be able to secure improvement through the assistance of the War Agricultural Executive Committee. The War Agricultural Executive Committees should at the same time be able to find valuable support in the statutory powers of the Authorities, where advice and offers of assistance are ignored.

It is, however, necessary to lay primary emphasis on the advisory aspect of the work arising out of the Scheme. It is well known that, while it is vital to secure as much milk as possible in the interests of nutrition, production and distribution have been made more difficult by shortage of labour and materials, difficulties of repair and replacement, the "black-out" and other war-time conditions.

In relation to the Milk and Dairies Orders generally, in view of the difficulties already referred to, and the fact that in some parts of the country many producers are for the first time entering production for the liquid milk market, it will be important to concentrate attention upon methods and cleanliness. Prior to the National Scheme, an experimental scheme on similar lines was carried out in certain counties. The results of that experimental scheme give definite evidence that of the major factors which have caused milk to be of unsatisfactory keeping quality, the following were the most important—failure to cool, inefficient sterilization, dirty utensils, wet handed milking, and dirty udders. Buildings proved to be of secondary importance.

Producer-Retailers and direct deliveries from farms to the smaller dairies present a special problem. It is intended that the National Milk Testing and Advisory Scheme when fully developed shall cover all milk, but the system applicable to the larger depots and dairies cannot be applied to producer-retailers, etc. It is intended, however, to develop a comparable system of routine sampling and testing to be followed up, as in the other class of case, by advisory work. Circumstances vary greatly between one area and another, and it has been felt essential to leave the working out of detailed arrangements to those responsible for the Scheme in each area. It is, however, hoped that Authorities will, if requested, be willing to assist in the case of producer-retailers, etc., by taking samples and sending them to the appropriate laboratory in accordance with whatever arrangements are made for the particular County.

Tuberculin Tested and Accredited Milks.—Apart from any other action they may take, War Agricultural Executive Committees have been asked by the Minister of Agriculture and Fisheries to communicate to County or County Borough Councils, as the case may be, unsatisfactory results obtained in the case of producers of Tuberculin Tested and Accredited Milks. It will be for Councils to consider whether there is any action which they ought to take as licensing authorities, to ensure that the conditions of licences as prescribed in the Milk (Special Designations) Regulations are being complied with.

Depots.—In the case of testing done at depots for the purposes of the Scheme, Local Authorities are not concerned in the actual sampling, but nothing in the Scheme abrogates any relevant requirements under the Milk and Dairies Orders relating to the handling, processing or conveyance of milk, or the statutory powers of Local Authorities in relation thereto. The provincial dairy bacteriologists are, however, giving special attention to those aspects of depot management, such as churn-washing, which may affect the keeping quality of farm milk supplies, and where Local Authorities meet with problems of this nature they may find it useful to make contact with the appropriate provincial dairy bacteriologist.

THE MEDICAL PROFESSION AND PASTEURISATION

Deputation to the Minister of Food

A plea for making milk safe by pasteurisation or other heat treatment was made by representatives of the medical profession to the Minister of Food on Thursday of last week. Lord Woolton was accompanied by Miss Florence Horsbrugh, Parliamentary Secretary to the Ministry of Health.

Professor Picken, who introduced the deputation for the British Medical Association, said the profession was satisfied that pasteurisation was the only practical safeguard and that it had no serious disadvantages.

Professor Garrod said that bovine tuberculosis was a widespread menace and from 5 to 10 per cent. of churn samples of raw milk were infected. Milk-borne tuberculosis chiefly affected young children and was estimated to cause 2,000 deaths a year, with many more cases of serious and sometimes crippling illnesses.

Dr. Alan Moncrieff, of the Royal College of Physicians, said children's doctors felt they must insist on safe milk rather than what was called "clean" or "pure" milk.

Sir Alfred Webb-Johnson, of the Royal College of Surgeons, said that if the Government did not take adequate steps to prevent the infection being conveyed to helpless children they could not escape being regarded as *particeps criminis*.

Professor Tytler said the case against untreated milk as a carrier of disease was as strong and well established as the case against the mosquito as the carrier of malaria.

Lord Woolton said that Miss Horsbrugh and he would report what had been said to their colleagues of the Government.

QUESTIONS IN PARLIAMENT

Health Services (Medical Advisory Committee)

Commander Galbraith asked the Secretary of State for Scotland what steps he is taking to keep in touch with representative medical opinion in regard to current problems affecting the development of the health services?

Mr. Johnston: By long-established practice, the Department of Health for Scotland has from time to time sought outside expert advice upon special medical problems. But I find there is in the profession a general desire for a regularly constituted Committee to advise the Department on the many problems with a wide medical interest which are confronting the country to-day. I have, therefore, set up a Medical Advisory Committee whose terms of reference are "to advise on the medical aspects of problems relating to the health of the people." I shall circulate in the Official Report a list of the members.

Commander Galbraith: I thank the right hon. Gentleman for that reply which he will be aware will give general satisfaction in Scotland.

Following is the list:

Medical Advisory Committee (Scotland)

Chairman:
Sir John Fraser, K.C.V.O., M.C., M.D., CH.M., F.R.C.S., F.R.S.ED.

Members:
Professor E. P. Cathcart, C.B.E., M.D., D.Sc., LL.D., F.R.S.
G. Matthew Fyfe, M.B., D.P.H.
Catherine Harrower, M.B.
Professor James Hendry, M.B.E., M.A., B.Sc., M.B., F.R.C.O.G., F.R.F.P.S.G.
Colonel T. D. Inch, O.B.E., M.C., M.D., D.P.H., F.R.C.P.ED.
D. Dale Logan, D.S.O., M.D., D.P.H., F.R.F.P.S.G. M.I.M.E.
Sir Alexander S. M. Macgregor, O.B.E., M.D., D.P.H., LL.D., F.R.F.P.S.G
Eneas K. MacKenzie, M.D.
A. F. Wilkie Millar, M.D.
R. Richards, M.A., M.D. D.P.H., F.R.C.S.
Sir John Boyd Orr, D.S.O., M.C., M.A., M.D., D.Sc., LL.D., F.R.S.
Professor A. Patrick, M.A., M.D., F.R.C.P., F.R.F.P.S.G.
Professor Sydney Smith, M.D., D.P.H., F.R.C.P.ED., F.R.S.ED.

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Tuberculin-tested Milk

Major York asked the Parliamentary Secretary to the Ministry of Food whether he has considered the effect on the future production of tuberculin-tested milk of allowing tuberculin-tested milk supplies to be pasteurised; and whether it is the policy of his Department to encourage the extension of tuberculin-tested herds?

The Parliamentary Secretary to the Ministry of Food (Mr. Mabane): I have no reason to think that the pasteurisation of tuberculin-tested milk would have any adverse effect upon the future production of such milk. It is the policy of my Department to support the Agricultural Departments in their efforts to encourage the extension of tuberculin-tested herds.

Major York: Will my hon. Friend consult with the Ministry of Agriculture to see whether an extension of the number of tuberculin-tested herds could not be brought about?

Mr. Mabane: We are in consultation on that point at the moment.

Dr. Summerskill: Is it not a fact that the highest authorities say that pasteurised milk is safer than tuberculin-tested milk?

Mr. Mabane: That is another matter.

Mr. Stokes: Is it not a fact that rats die of pasteurised milk?

Mr. Higgs: Is the Minister aware that not more than 5 per cent. of the dairy herds throughout the country are tuberculin-tested?

Major York asked the Parliamentary Secretary to the Ministry of Food whether he can give any indication of the amount of tuberculin-tested milk that is being bulked with non-tuberculin-tested milk; and whether he is satisfied that this mixing is in the interests of the future production of tuberculin-tested milk and the general raising of the standard of the milk supply of the country?

Mr. Mabane: The amount of tuberculin-tested milk which is not sold as such varies from month to month. In March, 1942, out of a total supply by wholesale producers of 3,880,000 gallons of tuberculin-tested milk, approximately 3,000,000 gallons were sold to buyers on the same terms as ordinary milk. It is probable that most of this was bulked with ordinary milk before sale to the consumer. My noble Friend is at present considering whether means can be devised both to encourage the future production and consumption of tuberculin-tested milk and to raise the general standard of the milk supply of the country.

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Tuberculosis, Wales (Milk Supply)

Sir C. Edwards asked the Minister of Health whether he is aware that the Chairman of the Glamorgan County Council Diseases of Animals Committee has stated that unless there was an improvement in the condition of the milk, public authorities should stop the distribution to children as a means of stopping the spread of tuberculosis; whether the increase in this disease coincided with the introduction of the milk scheme; whether in the years prior to 1938 the incidence of tuberculosis declined in Wales; whether since 1939 the incidence of tuberculosis in children under 11 years of age has increased and by what percentage; and what steps he proposes to take to deal with this state of affairs?

Miss Horsbrugh: I have seen a Press report of the statement mentioned. In the great majority of cases tuberculosis due to bovine infection is non-pulmonary, but, at all ages, it constitutes about 40 per cent. only of the cases of non-pulmonary tuberculosis. The incidence of non-pulmonary tuberculosis in children under 11 in Wales gradually declined up to 1937, but began to rise in 1938. The increase was rather more marked in 1940, the year in which the national milk scheme was introduced. The numbers of cases notified in the years 1940 and 1941 were 388 and 389 respectively, an increase of 16 per cent. compared with 1939, and of about 12½ per cent. compared with the average for the years 1933 to 1939. My right hon. Friend has from time to time informed the House of the steps he is taking to cope with the increased incidence of tuberculosis and in particular my right hon. and Noble Friend the Minister of Food, with whom he is in close touch on the matter, has under active consideration the practical steps that can be taken to secure the elimination of active tubercle organisms from liquid milk.

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African Colonies (Soil Conservation)

Mr. Sorensen asked the Secretary of State for the Colonies whether, in any consideration of post-war economic policy for African Colonies, attention is being given to the problem of soil erosion and means of combating this?

Colonel Stanley: The conservation of the soil and its fertility receives the constant attention of African and other Colonial Governments and very considerable progress has already been made in carrying out measures to meet the immediate and pressing problem of soil erosion. Further measures for soil conservation take a prominent place in all plans for post-war agricultural development in the Colonial Empire.

Mr. Sorensen: Are the methods employed before the war to combat this great problem continuing, and is special attention being paid to this problem?

Colonel Stanley: I entirely agree that this is one of the gravest problems in most of the Colonies. Measures taken before the war are being continued and have been extended in spite of the war.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Mar. 3rd.—Meeting of the Editorial Committee, N.V.M.A., 36, Gordon Square, W.C.1, 2.30 p.m.
Mar. 4th.—Meeting of the Central Veterinary Society, Conway Hall, Red Lion Square, W.C.1, 2.30 p.m.
Mar. 5th.—Annual General Meeting of the South Wales Division, N.V.M.A., at Carmarthen, 1 p.m.
Mar. 10th.—Meeting of the West of Scotland Division, N.V.M.A., at Glasgow, 3 p.m.

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PERSONAL

Major Andrew Spreull's Deputy Lieutenancy

His many friends in the profession will welcome the high honour bestowed upon Major Andrew Spreull, D.S.O., M.R.C.V.S., by his appointment, on January 5th, 1943, as a "Deputy Lieutenant for the County of the City of Dundee." The services which Major Spreull has rendered to his native county, his country and his profession are many. He was Chairman of the Dundee National Fitness Association from 1938-1939 and from September of that year served as Regional Veterinary Officer for the National Air Raid Precautions for Animals Committee for the City of Dundee and rural areas, and for the Farm Livestock Emergency Service from 1941. Major Spreull, who was a member of the Council of the Royal College of Veterinary Surgeons from 1930-1934, has had a distinguished military career, securing five war medals and the Territorial decoration. His studies as a veterinary student were interrupted for service in the South African War, when he was mentioned in dispatches by Lord Kitchener. On August 4th, 1914, he was mobilised with the Fife and Forfar Yeomanry and

in July, 1915, was appointed O.C. 4th Mobile Veterinary Section, 4th Division, in France. Twice mentioned in Dispatches by Sir Douglas Haig, he was awarded the D.S.O. in 1917 and was gazetted Acting Lieutenant-Colonel and A.D.V.S., 8th Corps, in the following year. Major Spreull has 32 years' uninterrupted Territorial service to his credit and has been a member of the City of Dundee Territorial Association since 1920. From 1919 (when he was demobilised) to 1925 he was O.C. 51st Mobile Vet. Section and from that date to 1929 A.D.V.S., 51st (Highland) Division.

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Mention in Dispatches.—Our readers will be interested in the announcement that Major K. C. Gresham, R.E., son of Mr. F. B. Gresham, M.R.C.V.S., of Newark, Notts., has been mentioned a second time in a Dispatch for distinguished service in the Middle East Force. After leaving Nottingham University he was employed by Messrs. Balfour Beaty & Co., engineers—at this time he captained Colville Rugby Football Club—and was then sent to Dar Es Salam and on to Palestine, being in Jerusalem when war broke out and immediately joining up there with a commission.

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FOOD PRODUCTION AND CONTROL

Agriculturists' Plan for Reorganisation of the Ministry of Agriculture

The report is issued of the special committee, with Sir Arthur Hazlerigg as Chairman, appointed by the Royal Agricultural Society of England to consider post-war policy. The Committee recommends a reorganisation of the Ministry of Agriculture which would include the setting up of a statutory body, on the lines of the Forestry Commission, for food production and control, free from political controversy. Appointed by the Minister of Agriculture (who would be responsible for it to Parliament) its main duties would be: (1) To deal with the present work of the Food Ministry; (2) to function as an Imports Board; (3) to stabilise prices and link guaranteed prices to guaranteed wages; and (4) to make sure that the land is farmed well, and that the fertility of the soil is not only maintained but in many cases materially increased.

The report urges that after a complete survey of the land, a definite acreage should be earmarked and set aside for agriculture and that, so long as it remains thus earmarked, it should not be liable to death duty levy. Land owners and farmers would naturally have to submit to more control than hitherto under ordinary peace-time conditions. The Committee propose for each county a special committee with one or more paid executive officers, who would travel the county and report to their committee, which would deal drastically with cases of bad farming. There would be right of appeal to an impartial tribunal of experts in farming and members with some legal experience. The change would entail the repeal of part, if not all, of the Agricultural Holdings Act, 1923, and county councils would need new agricultural committees, which would still deal with small holdings, diseases of animals, and agricultural education.

In the reconstruction of the Ministry of Agriculture provision will have to be made for a recruitment of a special branch of the Civil Service having practical experience of farming. As a first measure the Committee recommends that five surveyors of food production, drawn from the ranks of those who have themselves farmed successfully, should be appointed to the staff of the Ministry to be graded as first-grade Civil Servants commanding high salaries. The whole basis of entry into the Ministry and promotion, it is suggested, should be reorganised, and almost every entrant should undergo training to include at least one year's practical work on a farm. He should either take a degree in agriculture at a university or a two-year course at any agricultural college, where, after passing an examination such as a national diploma in agriculture, he could graduate into the Ministry.

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LEGAL NOTES

Foot-and-Mouth Disease Orders Offences.—For offences under these Orders two Somersetshire farmers were heavily fined by the Chard magistrates recently.

Mr. R. W. Young, of Taunton, prosecuting in the first case, which was one of failure to report a suspected case with all practicable speed, said that on November 16th last year the defendant, F. E. P. Coleman, of Whitehall Farm, Coombe St. Nicholas, rang up the police and informed them some of his cattle were not what they ought to be. Two veterinary surgeons found no fewer than 35 animals affected—22 of them obviously affected. Defendant said to one of the officials that the first animal to show signs was a heifer four days before. The veterinary surgeons found that signs of the disease were undoubtedly three or four days old.

Capt. John Fox, veterinary inspector of the Ministry of Agriculture, said he told Coleman he should have reported the case much earlier, as it was the worst he had seen of all the outbreaks there were locally. He replied he did not supervise or see his cattle very often and he left it to his men. He admitted that his man had told him there was one cow lame and crippled, but that he thought this was caused by the animal being "horned" by another cow. Witness added that this outbreak was responsible for other outbreaks at Wadeford and Chard.—Cross-examined, witness said Coleman did say there was nothing to show him there was anything wrong until the morning he reported it.—Mr. Francis Dunlop, veterinary inspector, and police officers also gave evidence.

Coleman, who pleaded *Not guilty*, said on Thursday, November 12th, none of the other cattle showed any signs of ailment or lameness, nor was there anything to make him suspicious that something was wrong. It was the same on Saturday and Sunday. On the Monday morning his cowman made a communication to him, and then he saw things that made him suspicious and he immediately notified the police. He had never before seen foot-and-mouth disease.

The Chairman (Mr. Leonard Hepworth) said the magistrates were unanimous that the prosecution had made out their case.—Defendant was fined £25 and £7 13s. 6d. costs.

Outbreak on Chard Farm

On a similar summons, T. B. Scott, of Chard Farm, Chard, also pleaded *Not guilty*.

Mr. Young said defendant made a report to the police. Capt. Fox found 25 animals suffering from foot-and-mouth disease which was four or five days old. Scott told the veterinary surgeon he did not know what the symptoms were, but he did know the disease had been on a farm a couple of miles away. They would have evidence, said Mr. Young, that on November 24th defendant was actually treating these cows with one of the home-made remedies for the disease.

A member of the Women's Land Army, who was working for Scott in November, said she saw Scott treating one of the cows with Stockholm tar.

Capt. Fox said when he interviewed Scott he asked him why he had not notified the police or a veterinary surgeon when he had occasion to treat the first cow, and he replied that he did not suspect the disease, and also said he did not know what the foot-and-mouth disease symptoms were. One bull and four cows were so badly affected that they had a very dejected appearance and their feet were "boxed under."

Defendant said on the Monday he went round his stock and found one cow a little lame. He treated this for "lure" with tar. Next day it was getting better. One of his men said he had pulled a stone out of another cow's hoof, but he could find nothjng wrong and treated it with tar to prevent infection. On Wednesday he noticed another cow running at the mouth. His suspicions were now aroused and he reported the matter to the police.

The Court inflicted a fine of £25 and costs, £3 12s. 6d.

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MINISTRY OF AGRICULTURE NEWS SERVICE

Milk Production

Up to the end of last year 4,367 farmers had placed their herds under the National Veterinary Scheme for the control of diseases in dairy cattle. 180,000 cattle were "on the panel" and were receiving regular veterinary inspection for mastitis, Johne's disease, sterility and contagious abortion. As the number of "panel patients" increases so the annual loss of 50,000,000 gallons of milk through disease will decline.

Good Response to Milk Recording Scheme.—More than 5,000 farmers joined the Junior Scheme of National Milk Records in its first week (January 1st to 8th) and 60 per cent. of the applicants asked the Milk Marketing Board to be allowed to record at least once a week instead of once a month. The request has been granted and the Board are supplying forms that enable farmers to record weekly, but present conditions make it impossible for the returns to be analysed on more than a monthly basis. Each farmer receives from the Board a full analysis of the yields recorded.

Milk Recording Reveals Non-Profit Making Cows.—It is quite probable that many milk producers if questioned on the value of milk recording would reply—"to find out which are the best yielders." While this is true, it is only half the truth, for it is of equal importance to know which are the low yielders—the non-profit making cows. These animals, because of their poor food

converting qualities, are ration wasters, and recorded production figures give reliable data upon which culling, feeding and herd management can be based to lead to an increased herd yield at the end of the year.

Winter Milk Meant More Milk.—Before the war Mr. Henry Horton, of Marden Farm, Wilsford, one of Wiltshire's best known producers, was a summer milk producer. Since the war he has turned over to winter production and his recorded yields in the last twelve months showed an increase of 14,368 gallons and his attested herd of 400 averaged 700 gallons per cow for the last lactation period. Mr. Horton has demonstrated that winter milk production fits in with the ploughing up policy. He has ploughed up 500 acres of his grass land and grows enough feeding-stuffs for maintenance and the first gallon.

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Milking.—A good milker remembers three essential points: quietness, speed and thoroughness. He milks from start to finish without stopping to talk. He "strips" with quiet and thorough efficiency: there is no vigorous pulling and stretching of the teats. Dry-hand milking is far better than wet: if the udder and hands are both washed clean before milking, the skin is moist, pliable and easy to handle. It is a dirty practice to squirt milk on the hands at the start of milking and it is also a bad habit to milk the first draw on to the shed floor. Stale milk provides bacteria with an ideal breeding ground.

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Swill

A Word of Warning.—The law requires raw swill to be boiled for one hour before being fed to pigs. There is good reason for this demand. It protects stock from disease and the farmer from loss. Any person found guilty of feeding raw swill to pigs is liable to a fine not exceeding £50, or, if the offence is committed in respect of more than ten animals, to a fine not greater than £5 for each animal. Already this year there have been 32 prosecutions.

A very large tonnage of swill is sterilised before distribution to stock keepers, and the Ministry of Agriculture is collaborating with the Waste Food Board in arranging central sterilisation in additional areas wherever possible. It is much safer to use this treated swill on the farm than the untreated. Never forget the dangers of raw swill. Outbreaks of foot-and-mouth disease and swine fever have been traced to carelessness in handling it. If swill is handled in this form there are four essential points that must be observed. Boil the swill as soon as possible after delivery. Keep poultry and all animals (dogs and cats included) away from the swill before boiling. After boiling, place in a separate container, not the one from which it was tipped into the boiler. Disinfect boots and wash hands after contact.

Price of Service Swill.—More farmers than ever are using Army, Air Force or Naval swill to supplement the supply of other feeding-stuffs for pigs or poultry, but many such users may not have realised that the price of Service swill is now controlled in the same way as that of swill or kitchen waste from civilian sources.

No raw swill, whether from civilian or Service sources, may be bought or sold at more than 30s. per ton net weight exclusive of carriage and containers. Service swill, however, is not generally sold by weight, but on the basis of the average number of men in mess per month. Where this is so, the maximum price that may be paid is 15s. per 100 men per month, which has been accepted as equivalent to 30s. per ton.

Farmers are reminded that by law all swill must be boiled for at least one hour before feeding to stock, unless it has previously been sterilised at a concentrator or boiling plant for which a certificate under the Foot-and-Mouth Disease (Boiling of Animal Foodstuffs) Order has been granted.

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Winter Feeding.—It is a good plan to see how winter food supplies stand at this time of the year. How long winter feeding must continue depends on district and season, but few farmers can count on much help from spring grass before the middle or end of April, even in a good spring.

Top dressing some of the earlier and sheltered grassland in February or early March with 1½ cwt. per acre of sulphate of ammonia will bring the crop along a fortnight or so earlier than if the fields are left untreated.

It is always advisable to work out fodder requirements for the full winter period and try to effect economies. Should there be a little hay left over till next winter, it will be a nice nest egg in view of the reduced acreage of permanent meadowland. The main plan should be to see that roots, hay, straw and silage are fed at rates that can be kept up until it is certain that there will be ample keep on the pastures, even in a late spring.

If a silo of well made silage can be left unopened, it will help in next winter's feeding or serve as a useful safeguard against shortage of keep in a summer drought.

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Loss to the Land Prevented by Adequate Use of Litter.—At no time should liquid manure be allowed to run to waste, particularly under war conditions, when the shortage of potash fertilisers is a serious matter. Wherever stock are congregated a liberal use of straw as litter will help to conserve this valuable product.

If liquid manure is allowed to drain away, some idea of the loss to the land may be judged from the fact that over 25 weeks the quantity of liquid manure from a herd of 40 dairy cows, properly conserved, represents—3½ tons of 30 per cent. potash salts—2½ tons sulphate of ammonia and nearly ½ ton of superphosphate. At current prices that means about 25s. per cow or a total of about £50.

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Grass Was Growing in December on Re-seeded Pastures.—Farmers who have provided themselves with new leys are deriving one of the greatest benefits accruing to agriculture during the past half-century. Many have found that the new herbage increases the milk yield by as much as a daily half a gallon per cow, and that when the cows are taken off new grass and put on to old pasture the yield deteriorates.

On some farms new leys have been so successful that grazing was possible in December and the grass was still growing in January. But there is a limit to re-seeding while the nation's need is for the fullest possible acreage of tillage crops. The War Agricultural Committees are rightly keeping a close watch on the leys.

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Cause of Death in Rabbits

Expert Advice May Prevent Further Losses.—Though health is normal and disease abnormal, occasional deaths do occur even in the best regulated rabbitries. Letters from unfortunate rabbit keepers show that the first death is regarded as a bit of bad luck, the second starts a train of thought; but it is not till three or four youngsters have died that action is taken. By this time it is too late to arrest the spread of infection.

A dead rabbit is no use to anyone, and considerable loss may be avoided if the carcase is sent to a reliable laboratory or to a veterinary surgeon for *post-mortem* examination. Fees vary, but they are never high if you remember that to know the real cause of death is to prevent further losses.

If you already belong to a club, don't regard it solely as a means of getting bran; make use of it. Find out the nearest laboratory if one of a litter dies unexpectedly.

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Kale and green crops are now generally finished and silage is being fed. Many cows will be receiving silage for the first time and it should be introduced slowly. Feed oat and tare silage first; keep young grass and aftermath silage for later. Changes of diet from kale to silage or straw to hay check the normal decline of milk in the lactation. October calving cows welcome these changes and hold their milk yield a few weeks longer.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
Jan 1st to 15 h, 1943	14	7	—	2	13
Corresponding period in—					
1942 ..	12	—	2	3	4
1941 ..	25	22	—	3	4
1940 ...	21	4	4	3	1

NOTE.—The figures for the current year are approximate only.
*Excluding outbreaks in Army Horses.